Oh,
My Aching Arm!

THE CAUSE AND CURE OF
GENERAL WRITER'S CRAMP

A MONOGRAPH IN
THE PHYSIOLOGY OF HANDWRITING

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Dedicated to Robert E. Backman
a gentleman, a scholar and
very fine friend.

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INTRODUCTION

DEFINITIONS OF WRITER'S CRAMP

The following two definitions of writer's cramp are taken from works cited in the annotated Bibliography. A more generalized definition of my own is given after them.

"Writer's cramp is a syndrome of muscular spasm of the fingers and hand during writing. The pen is held tightly, the writing becomes jerky, and the writing position, distorted; the pen may be forced through the paper, and the sufferer becomes preoccupied with the manner of writing. The pain often spreads up the arm to the neck and even into the other arm. The course is usually chronic and progressive. It is a rare disorder, usually beginning between thirty to forty years of age and is more common in men...."
Item 4 in the Bibliography, page 44.

"Writer's cramp . . . is one of a large group of functional motor disorders, known as 'occupational neuroses and cramps . . .,' wherein there is a specific impairment of a learned motor skill. Generally, writer's cramp is characterized by muscular spasm, incoordination, and discomfort, variously described as fatigue, weakness, stiffness, or pain when attempting to write. Occasionally, there is an accompanying tremor or jerking of the involved upper limb. There is said to be great variability in the detailed clinical picture. Writing may be difficult or impossible, but outside the act of writing the symptoms generally disappear. Often there are fluctuations within a chronically progressive course but the condition may arrest at any stage of its development."
Item 2 in the Bibliography, page 841.

I believe writer's cramp is a continuum starting from any inordinate grip pressure, or excessive muscular tonus, or a failure of muscle groups not involved in a particular directional movement to relax the contraction required for their own directional movement. That is what is meant by "general writer's cramp," a term I have coined, and it will serve as our working definition for this monograph, unless the context indicates another meaning is being discussed.

Writer's cramp would be a medically pathological condition when the symptoms described in the quoted passages are present and, in that case, would best be designated as clinical writer's cramp. However, any degree of excessive muscular tension during writing can be a seed which could theoretically grow into clinical writer's cramp. We must also distinguish between two clinical types: simple and dystonic writer's cramp.

The latter would entail an organic cause, while the former would entail a behavioral and/or psychological cause. Some writers in the medical literature which was surveyed referred to simple writer's cramp as a dystonia, so one always must be aware of the context and of a particular author's use of terminology.

The graphologist who undertakes to deal with general writer's cramp must be most cautious so as not to treat a condition which has become clinical or to fail to direct a client to seek proper medical attention. Whenever a writer's cramp gives any appearance of being clinical, consultation with a licensed medical practitioner should be advised. I believe that the two major causes of general writer's cramp are internalization of environmental stress and lack of graphic skill. If there is a specific psychological disturbance, a properly trained, licensed and experienced clinician ought to be consulted. If there is an organic element present, either as to the cause of the condition or as to damage resulting from the condition, a medical professional ought to be consulted. This monograph will address only the non-clinical type included in my generalized working definition, in which lack of skill would be the principal operative cause and in which there would be no specific clinical aspect, whether physical or psychological.

On the following page is the outline of the presentation as given at the 1997 Vanguard Conference at Asilomar, CA. That outline also served as the outline for this monograph, with minor adjustments.

PHYSIOLOGY OF HANDWRITING

AS EXEMPLIFIED BY WRITER'S CRAMP

PRESENTATION OUTLINE

1 Some basic anatomy

- a. Bone structure of the hand/arm
- b. The four groups of muscles used in handwriting
- c. Muscles working with and against each other

2 Grip of the pen

- a. The two basic grips and individual variations
- b. Problem grips

3 The grasp of the pen

- a. Grip pressure
- b. Getting out of one's own way

4 A writer's cramp

- a. Concept of the continuum
- b. The "graphic indicator of tension"
- c. Finding the right grip for you
- d. Mastering the right grip

5 Concluding remarks with bibliographic comments

NOTE: This presentation is an experimental presentation. Those attending will actively participate by writing as instructed, and thus they will experientially learn the matters discussed. No one will analyze anyone else's writing, but the writer for oneself.

1. SOME BASIC ANATOMY

A. WHAT IS PHYSIOLOGY OF HANDWRITING.

The physiology of handwriting can be viewed in two ways. Before distinguishing them, a look at the general meaning of the word "physiology" is a good place to start. We will have reference to Webster's Third International Dictionary to do so. The prefix "physi-" or "physio-" means nature, natural. Our word "physical" comes from it, and so it can mean "body" or "bodily." The suffix, "-ology," means study of or science of. Thus, etymologically "physiology" only means the study of the nature of a thing or study of its physical characteristics. As a formal discipline, "physiology" means the "branch of biology dealing with processes, activities, and phenomena incidental to and characteristic of life or of living organisms : the study of the functions and activities of living matter...." The third meaning given is: "the organic processes and phenomena of an organism or any of its parts or of a particular bodily process...."

In the last meaning given, our first use of "physiology of handwriting" refers to the bodily processes involved in the production and execution of the handwriting. Our second use of the term applies the etymological meaning and refers to the physical characteristics of the finished product itself. The first we can specify as the physiology of the writer or as the physiology of the act of writing. The second we can specify simply as the physiology of handwriting, meaning the finished product itself, thus encompassing the entirety of the observations and measurements we can make of the finished product in accordance with a systematic and established method of observation.

In consideration of general writer's cramp, we will first study the bodily parts directly involved in the act of writing and of their functions during the act of writing, which would be the physiology of the writer. As we go along, we will relate this to the effects it has on the finished product, which would be the physiology of the handwriting. These two aspects will be interwoven so that our understanding will be as complete and comprehensive as space permits; however, the emphasis will be on the very act of writing and on how the functional problems involved can be corrected or at least alleviated. The Bibliography will point to the further and more in-depth enquires which can be made by those wishing to pursue the matter more fully.

In keeping with the sharp distinction made between general writer's cramp and clinical writer's cramp, the latter aspect is touched on only in so far as it assists us in better understanding general writer's cramp, both as to causes and corrective actions.

B. BONE STRUCTURE OF THE HAND/ARM.

Every graphologist and handwriting expert ought to own an illustrated human anatomy text. Though one might not feel compelled to learn the names and precise details of anatomical parts involved in the act of writing, one ought to have a general knowledge of the major components and a basic understanding of the practical application of that knowledge. For simplicity's sake, we will look at the bone structure of the arm and hand as a complex of levers. As you may recall from high school science, a basic lever entails a rigid tool pivoting on a fulcrum at its center. A force is applied at one end in order to move a load at the other. The three may exchange position, so that the fulcrum is at one end, and either the load or applied force at the other. The force may be applied by pushing or pulling, and the load may moved by being pushed or pulled. In the act of writing, the multiple levering actions involved run the gamut of the variations on the basic lever. We will concern ourselves only with the minimum required for understanding writer's cramp.

The bones of the upper arm and lower arm make for two rigid tools working together during writing. Most of the muscles and tendons moving the hand and fingers are anchored in the lower arm, which in turn is moved by muscles and tendons anchored in the upper arm. Through their contraction, muscles provide the force in human movement, while the tendons are the means by which the force is applied directly to the part to be moved (for example, the index finger), which part is the load in the first layer in the lever system. The thing to be moved (for example, the pen) becomes the tool in the final layer in the lever system, the index finger being the applied force and the pen point being the load, in which case the grip is the fulcrum upon which the pen moves. It can be easily seen that there are multiple forces moving the pen in multiple directions and thus comprising a complex of levers which must work cooperatively.

If the arm is held too straight, so that the elbow forms nearly a 180 degree angle between the upper and lower arms and the hand is positioned farthest from the shoulder during writing, horizontal extension of the fingers is facilitated but vertical extension is hampered. See Figure 1. If the arm is bent to decidedly less than 90 degrees, the opposite occurs: vertical extension is facilitated and horizontal extension is hampered. See Figure 2. With the elbow bent between 80 and 100 degrees, a happy balance is achieved between horizontal and vertical expansion, all things being equal. See Figure 3. Test this for yourself before proceeding further. If the writer adopts either the nearly 180 degree bend of the elbow or decidedly less than 90 degree bend, some compensation must be made if the writer wishes to overcome the resulting inhibition in either vertical or horizontal extension.

Any compensation requires extra effort, which requires more muscular contraction and which in turn may contribute to excessive tiring during the act of writing, and that is what writer's cramp is. Any compensation during the act of writing will show up as graphic tension of some kind or as observable adjustments of the hand or arm. The latter are most easily seen in misalignment of adjacent words or letters which is evident in variations of base line (Figure 4) and/or slant (Figure 5). Such adjustments may even be made within letters which are bi- or trizonal. The different parts of the same letter in different zones will be off-set from each other or be executed on different axes. See Figures 6 and 7.

C. THE FOUR GROUPS OF MUSCLES USED IN HANDWRITING.

There is a complex of muscles involved in handwriting, various muscles moving the fingers, hand and arm in various directions. Actually writing also directly involves some muscles in the shoulder, back and chest, and indirectly in every part of the body, since one must maintain some bodily posture while writing. For our purposes, we will only consider muscles directly involved in the actual movement of the pen. Even then, we will not discuss individual muscles, but the groups of muscles which work together for specific directional movements. These directional movements are (a) away from the center of the body, called extensor movement, (b) towards the center of the body, called flexor movement, (c) laterally, across the body, to the right, called abductive movement, and (d) laterally, across the body, to the left, called adductive movement.

The last two are taken as in a right handed writer with a straight penhold, a straight pen hold meaning one where the pen shaft points more or less back to the writer's shoulder. These terms would be reversed in a left handed writer with a straight pen hold. Using a hooked or inverted pen hold, where the pen shaft points more or less away from the writer's shoulder, would again reverse things. However, for simplicity of explanation, we will assume we are dealing with a right handed writer with a straight pen hold, and one need merely switch "adductive" and "abductive" for each other in order to have the discussion fit alternative situations.

The flexor movement is made by contraction of the flexor muscles. They are the more massive of the muscles and thus exert the greater force. As a result, it has long been recognized among graphologists and handwriting experts that the "natural" pressure pattern in handwriting is to have notably greater pressure on down strokes, which are in the direction of flexor movement, than on up strokes or lateral strokes. When such is not the case, we will have the most significant observation relative to writer's cramp. Thus, pen point pressure will be a major element of the discussion. The flexor muscles are principally on the inside of the forearm, that side which is turned toward you when the palm of the hand is turned towards you.

Extensor movement is made by contraction of the extensor muscles. These muscles are principally on the outside of the forearm, the side away from you when the palm of the hand faces you. Up strokes are extensor strokes. Please note that just as all voluntary bodily movements can only be made by muscular contraction, that is inducing flexive tension in the appropriate muscles, so up strokes can only be written through muscular contraction, through flexive tension in the extensor muscles. Therefore, contrary to a common graphological myth, up strokes do not represent release any more than any other strokes do. We will find that muscular release, and thus psychological release, is represented in a far more wondrous and intricate fashion, and likewise for muscular tension, and thus psychological tension.

Adductive movement is made by contraction of the adductive muscles. "Adductive" literally means "leading towards," thus it is leading the pen towards the body, assuming the pen's position begins in line with the shoulder. Simply consider it as a lateral movement across the body from right to left. Adductive strokes are horizontal strokes made right to left.

Abductive movement is made by contraction of the abductive muscles. "Abductive" literally means "leading away from," thus it is leading the pen away from the body, assuming again that the pen's position begins in line with the shoulder. Simply consider it as a lateral movement across the body from left to right. Abductive strokes are horizontal strokes made left to right.

Before reading further, look at the hand/arm muscle chart in your anatomy book. Flexing your own muscles, see if you can put your finger on the major muscles in the four groups identified above, along with the tendons which tie the fingers to these muscles. The flexor should be the easiest to feel, the extensor next easiest, but you might well find it hard to feel the adductive and abductive, the weakest and least prominent.

C. MUSCLES WORKING WITH AND AGAINST EACH OTHER.

So far, four directions of writing movement have been accounted for, but not diagonal and circular movements. How are these accounted for? These directional movements are made by the same four groups, but by two out of the four acting in coordination. Since all directions, up, down, lateral, and diagonal, are contained in a completely circular movement of 360 degrees, the manner in which the four groups work cooperatively can be illustrated by the simple writing of a complete circle. Draw a large circle on a piece of paper counter-clockwise, being sure to begin, complete and close the circle at the one o'clock position. In making the circle, each group of muscles must perform its specific chore theoretically for an eighth of the circle, and each pair of "neighboring" groups must work coordinately theoretically for an eighth of the circle. I say "theoretically," since it is really not that clearly demarcated, but we can speak that way for illustrative purposes.

As the pen moves to the left across the 12 o'clock position, the movement is adductive, and only the adductive muscles are required for the movement. To move through the 11 and 10 o'clock positions, the adductive muscles are still needed since the pen is going to the left, but also the flexor muscles are needed since there is a movement downwards. Thus, the adductive and flexor muscles must work coordinately, the adductive muscles carrying the greater chore at the 11 o'clock position and the flexor muscles the greater chore at 10 o'clock position, till the adductive muscles are no longer needed as the movement is solely downward through the 9 o'clock position. Thus the adductive muscles must slowly fade out while the flexor muscles must slowly fade in order to have a fluent and smoothly formed stroke.

As the pen approaches the 8 o'clock position, movement to the right is added to the downward movement, thus requiring the assistance of the abductive muscles, but requiring less and less assistance from the flexor muscles as the pen passes through the 7 o'clock position. Again, the flexor muscles must gradually fade out as the abductive muscles gradually fade in, until finally through the 6 o'clock position only the abductive muscles are required. As the pen approaches the 5 o'clock position, we have the same fading out and fading in, except now the abductive muscles must fade out and the extensor muscles fade in, till only extensor muscles are required through the 3 o'clock position.

As the pen closes the circle at the 1 o'clock position, the adductive muscles cooperatively fade in and the extensor muscles cooperatively fade out till they are at the balance they were at for the beginning of the circular stroke. In turn each of the four sets of directional muscles has faded in, grown to maximum effort, and faded out. On the fade-in and fade-out, each set of muscles cooperated with its neighbors on its "either side" of the oval.

What happens when a set of muscles does not let go when its directional movement is not required? The set of muscles needed for the movement must not only exert the force needed for the movement, that is to induce sufficient flexive tension, but it must overcome the tendency of the unneeded muscles to carry the pen into the unwanted direction, thus inducing extra flexive tension, which is excessive tension. This excessive tension means extra work, which means extra tiring, which means the writer is on the way to cramping. Whether one arrives at cramping depends on the amount of extra contraction needed to overcome improperly flexed muscles, the length of time of writing, and other factors. The major factor always remains the improperly maintained flexion in the muscle not needed for a particular directional movement.

There are other groups of muscles which are very important for movement in handwriting, but which serve the function of movement, not by moving, but by stabilizing the various fulcrums around which movements occur. These muscles provide the tonus which securely positions the various parts of the body from where muscular exertion can be applied to the working parts of the body and thus to the writing instrument and materials. Although each such set of tonal muscles is critical to handwriting and a factor in writer's cramp, for simplicity's sake and illustrative purposes, only the most critical of these will be considered: the pen grip. Please note that some muscles involved in pen grip are involved also in moving the pen, while we will talk as if entirely different muscles are involved. This way of talking will work quite well for practical purposes.

2. GRIP OF THE PEN

A. THE TWO BASIC GRIPS AND INDIVIDUAL VARIATIONS.

There are two basic grips of the pen, and as many variations as there are humans on earth who write with a pen. These two are:

(a) The traditional grip taught in schools since the first writing masters of the Western world authored their books. This is with the pen held at about 60 degrees to the paper, with the middle finger turned under the pen and touching it just beyond the last joint, the index finger gently flexed with the pad on the tip touching the pen, and the pad of the thumb touching the side of the pen. This provides a tripod point of contact and thus a secure yet gentle hold. The middle finger acts as a moveable fulcrum, while the index finger and thumb both apply force to the pen in order to move the load, which is the pen point along the paper. This grip is required for all ball type pens and is especially congenial for people with shorter or stubbier fingers or who write with predominant finger flexion.

(b) The other basic grip is to hold the pen in the manner in which an artist holds his brush, with all fingers extended but not rigid, the tip pad of the index finger on the pen, while the inside of the tip of the thumb and the left side of the tip of the middle finger provide the other two touch points for the pen. The index and middle fingers apply the force for movement while the thumb functions as the principal fulcrum. This grip is especially congenial for people with exceptionally long, slender fingers, as well as those who have less precision of movement in their fingers or use predominantly hand/arm flexion.

Since everybody is different, as is every body, so every hand and set of fingers is different. Each individual will have some degree of variation, no matter how minute, from the basic grips. However, each and every person with a problem grip will manifest a preference for a variation of one of the two basic grips. Please bear in mind that we are restricting our discussion to writing with a pen in Western systems, although, mutatis mutandis, the physiological considerations are applicable to writing with any instrument whatsoever in any writing system whatsoever.

B. PROBLEM GRIPS.

For our purposes, a pen grip is a problem if the muscular tonus needed to secure the pen sufficiently during writing is excessive or insufficient to the purpose. If the tonus is too little, insufficient, the muscles which are to make for movement must divert some of their effort into stabilizing the pen, otherwise it will fall out of the hand while writing. Too tight of a grip means the pen is to some degree frozen in place, thus requiring extra energy to overcome the greater inertia. In either case, we have extra exertion and thus extra tiring, which can well lead to cramping. Grip pressure will be addressed in the next chapter.

Any grip which radically diverges from the two basic grips creates a problem impinging on tendency to cramping. If one finger is placed other than where it can exert the most effective work with the most efficient application of energy, another or more fingers must be readjusted to compensate for the lost efficiency. That requires further readjustment, until sometimes you will see people who write with grips which are nothing other than a complexity of adjustments to problematic placement and employment of their fingers. Observing such grips without embarrassing the writer, note carefully how the hold is made and how the pen is moved with that hold. When alone, try to recreate the hold, comparing the results with your normal writing. If you find you have some problematic element to your own pen grip, there will be great blessing in discovery of the difficulty and its solution.

3. THE GRASP OF THE PEN

We must distinguish between what we can call the grip of the pen and what we can call the grasp of the pen. The grip of the pen would be holding the pen for the most efficient use of energy in writing and for the greatest facility for graphic movement. By the mere fact that we take a pen in hand, we necessarily impede certain movements. For example, hold your hand out level before you. Place your fingers parallel and touching each its neighbor on either side. Now open the fingers alike a fan, and close them again. Now hold a pen as for writing. Open your fingers as a fan, just as you did before. Naturally the pen falls out of your hand and writing becomes impossible. In order to write, you willingly give up some facility you have with your hands, just as you willingly give up engaging in other activities. So, for example, if you wanted to play golf and write a letter to your best friend all at the same time, your golf score would set a world's record for high numbers and your friend would be totally mystified as to what the missive was meant to relate or from whom it came; that is, if the postal service could ever figure to whom it ought to be sent.

A. GRIP PRESSURE.

An insufficiently stabilized pen means there is not a secure fulcrum from which to apply force to the load. The energy for force must be increased so that some of it can be directed to control of the pen, and this is true whether the grip pressure is excessive or insufficient for the task of securing the pen in the hand. Let us examine how both an excess and a defect in the amount of grip pressure requires extra work from the muscles involved in the directional movements of the pen.

If the pressure applied in gripping the pen is excessive, the pen is frozen into place rather than being permitted free play in response to the applied force of the four sets of directional muscles. There is a direct application of the old analogy of driving a car with the hand brake on. The motor must work harder than it ought to, and the moving parts of the car all suffer greater strain. Additionally, the brake pads on the hand brake system will burn out quite rapidly. In handwriting, the gripping muscles also require extra force from the moving muscles in order to move the pen across the paper. The gripping muscles, like the hand brake pads on the car, will be burnt out as well, that is their tight contraction on the pen plus their resistance to movement will put a strain on them which will lead directly into their cramping. The moving muscles, because of the extra effort and thus the extra contraction required of them, will also tend to cramping. Indeed, an excessive pen grip pressure may be even more effective in bringing on writer's cramp than the failure of the four sets of moving muscles to relax when they are not needed.

But how can too loose of a grip pressure lead to writer's cramp? One would expect extra relaxation to be extra relaxing rather than extra tensive. If the pen is not held with a sufficient pressure for control, it will tend to fall out of the hand or wobble in aimless directions while the person is attempting to make precise formations. If the gripping muscles lack proper tone for stable hold and control of the pen, the moving muscles must make up the difference. Thus the moving muscles must be moving the pen not only in the direction of the intended stroke form, but also away from the unintended direction of fall or wobble of the pen. Whereas we saw above that two sets of directional moving muscles would have to work together in specific situations, in the case of the too loose pen grip three or four might have to work simultaneously, one or two for the intended direction, two or three to overcome movement into the unintended directions. Which is why a debility which causes too loose a grip of the pen will result in tiredness from writing far faster than one would expect from such a "simple" chore as writing the signature, more tiring than maybe other manual activities which are not nearly as complex and involving of so many muscle groups as handwriting.

You can demonstrate to yourself the effect which too tight and too loose of a grip pressure has on handwriting. Write a sample with your normal pen grip. See Figure 8. This exercise should work even if you do have a grip which is either much too loose or much too tight, as long as it is not to an ultimate extreme either way. Now write the same passage, but this time grip the pen as tightly as you possibly can, all the while telling yourself to grip even tighter and to keep moving ahead with the writing. See Figure 9. It may be a bit traumatic before you finish, but that is alright, since it will give you an empathy for those with excessively tight pen grips. Now, write the same passage again, but this time barely touch the pen, just enough that it does not fall from your hand. Keep telling yourself to hold the pen even looser and to keep it moving. It is most likely you will experience loss of control, a sense of helplessly as the pen all but falls from your hand. See Figure 10.

Now imagine what your writing life would be like if you were stuck at the two extremes you just experimented with? Many people are, as a normal situation, stuck at the first extreme. The ill and elderly are often stuck at the second. Understanding what the two situations entail experientially is the first step to assisting these souls in alleviating their distress in the act of handwriting. But it is only the first of a hundred steps, so be careful not to charge out and apply an as yet imperfect mastery of the thing.

When the grip pressure is too tight and/or the sets of muscles involved in directional movement fail to release when not needed, the immediate effect is to produce an unvaried pen point pressure in all four directions of the movement. This in turn hampers the flexion of the fingers, thus disturbing the fine motor movements. The turns will tend to be narrowed or angular. See Figure 14. Since the fingers cannot easily flex laterally, narrowing of letter formations occurs, with retracing of up and down strokes becoming more evident. See Figure 15. Not only lateral, but vertical extension of the fingers becomes hampered, and thus upper and lower zones might be shortened, or the writing hand must be repositioned upward or downward on the paper to permit full extension of those zones. See Figures 16 and 17. As a result, the base line will often rise and fall before and after upper and lower zone formations.

The arm and hand cannot move smoothly across the paper when they are locked into place. Grosser adjustments often are needed when fine adjustments are prevented. If the elbow is swung in and out in order to position the hand which is too taut to reposition itself, changes in angle occur, even within words and at times within the more complex letters. See Figure 18. In all these observations, unvaried and displaced pressure is the key observation which tells of excessive muscular tension. Unvaried pressure would be where the lateral and up strokes are of the same or nearly the same heaviness as down strokes. See Figure 19. Displaced pressure is where the down strokes become light and either the lateral or up strokes become more heavily pressured. See Figure 20. The four groups of directive muscles in writing are in confusion as to when they are to flex or release and as to which ought to exert the greater force. And that is the key ingredient in general writer's cramp.

As the muscular tension becomes more extreme, tremor is introduced. See Figure 21. Short of tremor, there is inability to make fluent curves. If ovals become rectangular, the different directional muscles do not fade in and out cooperatively or may even have suffered nerve damage which prevents that. See Figure 22. If the ovals are triangular, one of the four sets of directional muscles might not be able to do its work. See Figure 23. Look to see if one of the directional movements is missing from the writing.

Let us return to the common graphological myth that down strokes represent tension and up strokes release. As we have seen from physiology, all four directions of movement must represent both in order to have writing free from cramp. There is a little exercise which can illustrate the falsity of this common myth. On a sheet of paper mark four dots at the top and five at the bottom, spacing them evenly across the page. Place the pen at the first dot at the bottom, and never lift the pen from the paper during this entire exercise. Push the pen all the way to the first dot at the top. Then let it drop to the second dot at the bottom, without being concerned with hitting it exactly. Anywhere in the immediate neighborhood of any dot is well enough. Push the pen back up to the second dot at the top, drop back to the third dot at the bottom, back up to the third at the top, back down to the fourth at the bottom, back up to the fourth at the top, and back down to the fifth at the bottom.

By now you should feel more effort and tiredness in the extensor movements to the top than in the flexor movements to the bottom. Why is that so? First, the flexor muscles are stronger and so can do their work with less effort proportionate to the energy available to them. Second, on the way down you have gravity assisting you. Third, the down stroke is the naturally more pressured stroke and thus more graphically assertive of the ego's feelings and impulses, thus satisfying in a way that up and lateral strokes are not. Last of all, ending a writing act by bringing the hand back towards the center of the body is to bring it back to its best resting place. If it is left at the top of the extensor stroke or to the extremes of the adductive or abductive strokes, muscular tension is required to maintain that position. At the bottom of the flexor stroke, the hand can be rested without extra muscular tension to hold it in place. However, every stroke in any direction is a tension in so far as muscular contraction is required to make it, and it is equally release and relaxation in so far as all unneeded muscles relax while it is made. So while writing, you can be as much as 50 to 75 % at rest at the most laborious of times. That ability to relax unneeded muscles is what most gives endurance in any physical activity. Physical conditioning is the other key factor in endurance.

B. GETTING OUT OF ONE'S OWN WAY.

There is a greatly humbling truth in the correction of these and other problems in difficult handwritings. That truth is that God has already built into our nerves, muscles and blood, into the very bones of our bodies, the wisdom required for masterful handwriting. Proper education is mostly a matter of leading that inherent wisdom into practical action. Reeducation, remedial penmanship, is mostly a matter of gently leading the ingrained habits out of the way of that inherent wisdom, so that the organism can do what God designed it to do, and often quite well thank you without human invention or counsel required. In a word, correcting most of our handwriting problems is simply a matter of getting out of one's own way. At most I can only intimate some of the techniques which can be employed in this endeavor which can give miraculous results. "Miraculous" means filled with a miracle. "Miracle" is from the Latin meaning "small wonder." It is, indeed, a series of wondrous little things to see improper tension melt away and effective, efficient, organically integral action take its place.

The discussion at this point will consider only the case of the too tight of a grip and of the problematic grip, such as grasping the pen in the clamped fist. The problem of the too loose of a grip is a much rarer problem and most often has ramifications of a medical dimension, so it behooves us to go cautious at best when faced with it. In any case, the following scenario has never failed me when faced with a writer having a problematic grip or an excessively tight grip.

Have the person write for you while you watch, but do not make a production of watching the writing. If you can, develop the facility of carrying on a seemingly extraneous conversation with others or observing other events in the room. With your peripheral vision, note carefully the dynamics of the grip and graphic movement. When the person completes the writing, start discussing some topic about handwriting which the person has expressed interest in, preferably not directly related to the grip problem, as we want the person to become as completely unmindful of the pen grip as possible. As the person's attention is given over entirely to what you are saying, your peripheral vision is keenly observing the involuntary activity of the hand holding the pen. What will happen?

As stated above, God has built a wisdom into the fabric of our bodies. The hand is not stupid, nor is it masochistic, whether or not the writer might have adopted such a wayward manner of obtaining pleasure. While the voluntary attention of the subject is directed to your conversation, the hand begins playing with the pen in order to find the most comfortable position to hold it. The gripping muscles instinctively try to relax so that their tonus is sufficient to the task of holding the pen securely, but not too tight and not too loose. Keep looking at the writer in the eye with your usual kindness and sociability. When you peripherally observe that the hand has pretty much settled on a particular grip and muscle tonus, that is almost to a complete certainty the ideal pen grip for that individual. Now you have two problems, the second, the easy one, I will give first.

That second problem is: What type of pen would best fit graphic movement with that specific grip and that specific grip pressure? Much of our writing difficulties, including the virtually epidemic occurrence of too tight a pen grip, is due to the use of ballpoint pens. The things simply do not write. What do I mean by that?

Any tool is a good tool to the degree that it easily does the work and the worker can work best by working easy with the tool. An example. A wood saw works best if its very weight as it glides across the wood eats away grains of wood to make a clean, precise cut. The carpenter works easily, only having to pull its weigh to lift the saw back up for the next cut and only having to push the weight of the saw forward to make another cutting stoke. If the saw is properly balanced, properly chosen for the task, and properly sharpened, sawing wood can be almost as restful as it is tiring. The cutting stroke is never forceful unless and to the degree it has to be directed for a specific effect or artistic expression. It is because old-timers are such efficient workers, knowing how to use good tools well, that they can outwork younger and stronger workers. A proper pen ought to be like a proper saw, one need merely push or pull it in the proper direction for it to write, no further force is needed to obtain a ductus. No force other than the naturally and spontaneously occurring force of the moving muscles is required, unless one wishes to make a special effect or expression for a specific reason.

Bottom line advice: Rid yourself and all your clients of ballpoint pens. They simply do not work, but require excessive effort to force them to work. Excessive effort requires excessively flexive tension in the muscles, and that leads to excessive tiring and possibly to cramping. You can test this poor tool quality of ballpoint pens for yourself. Hold a ballpoint pen vertically with just enough grip to keep it from falling. Move it around so that only the weight of the pen is on the pen point. Once any gooped ink "writes" off of the point, the pen will not make any visible ductus. See Figure 11. Now do the same with any fluid ink pen, such as a roller ball, fiber tip or fountain pen. The weight of the pen itself is sufficient to make a visible ductus. See Figure 12. Conclusion: The ballpoint pen is not a good tool and does not write; the writer must exert excessive force (both in grip tonus and in flexive movements) to compel it to write, excessive forces which contribute directly to general writer's cramp.

So to start getting out of your own way when writing, get the ballpoint pen out of your way and out of the way of all those with whom you have positive influence.

Now, back to the first problem mentioned earlier, the harder one. How are you to bring the naturally occurring pen grip to the writer's attention and have it adopted voluntarily? As soon as you ask the individual to observe how the pen is being held, the hand grips the pen in the old problematic way before the eyes can see what is happening. It is not human perversity, it is the deeply ingrained habit. So demonstrate for the person how the pen was held during the course of the conversation and how that will facilitate writing without tendency to tiredness or cramping. It is a slow re-educative process to have the person adopt the naturally occurring pen grip when writing with complete inattention to graphic mechanics. If one has scant patience or lacks a manner of gentle coaxing and encouragement, it is best not to embark at all onto this adventure.

If the person manages to write with the more natural and looser grip, there will be immediate confrontation with the need to control. Remember how you felt when you wrote earlier with the loosest pen hold you could obtain? Multiply that by degrees and years of ingrained habit, and that will give an inkling of what the subject is probably experiencing. If there is a psychological dynamic which might be clinical, one ought graciously to bow out and encourage the subject to seek proper counseling. Do not play psychotherapist without the appropriate education, training and licensing.

The subject can be given two little signs to watch for which will indicate excessive grip pressure. The first sign has to do with the flexion of the index finger on the pen. If the middle joint is bent nearly to 90 degrees or less, the grip is too tight. If the final joint of the index finger on the pen is not curved gently outward, the grip is too tight. The other sign has to do with the color of the skin and under the finger nails on the tips of the fingers which hold the pen. If they are not of their normal even color, the grip is probably too tight. If the color under the nails has clear demarcations between areas of white and intense red, the grip is definitely far too tight. The same goes for the flesh of the finger tips. Teach the person to relax the grip whenever either of these two signs are observed. You can train you own observation of these signs by holding the pen with alternating tight and loose grips, taking each to extremes.

Faithful adherence to daily remedial writing exercises is required to master the proper grip and grip pressure. Space does not permit the setting forth of all such exercises in full, but the following passage from an unpublished text will provide the basic exercise, one which has been introduced already in this monograph:

"Every body is unique just as everybody is. So we can have general guidelines for posture and grip, but no hard and fast rules. Thus what follows gives guidance on how to use the norm to find your personally proper and comfortable way.

"We can look at any aspect or part of handwriting as a spectrum. The perfect balance is right in the middle. The extremes of far too much and far too little are at the opposite ends. Since each person is different, the balance for a given individual could be anywhere within the middle half of the spectrum. A bell curve would put most people at or fairly near the mid point.

"Let us take an example. When one holds the pen, one would have a spectrum running from too tight a grip to too loose. On the far end of too tight, the fingers clamp the pen so hard that the muscles of the hand are frozen and writing is impossible. On the far end of too loose, the pen simply falls out of the hand as soon as writing begins.

"In the middle, the pen is held in the fingers as one would hold a baby in arms. The fingers support the pen on all sides but do not press or crush. The pen rests gently and comfortably in the hand.

"Easy-going people will be more towards the loose end. The dynamic doers will be more to the tight end. Thus we would have a bell curve.

"This same principle of the mean and two extremes applies in all other aspects of handwriting. If you are locked in at one extreme, you can get free by deliberately going to the other. By going back and forth you get the power to go to any point in between.

"For example, if you hold the pen too tightly, sign your name as you usually do. Then grip the pen as tightly as you possibly can. Sign you name and all the while tell yourself to grip even tighter. When finished, right away let go of the pen so it almost falls out of your hand. Sign you name again and keep telling yourself to let go even more.

Do the extremes of far too tight and far too loose two or three times more. Then try in-between grips till you get one that you can flow with easily. You are then at your happy medium.

"To break the habit of the old too tight grip, you have to form a habit of the new easy grip. You do so by repeating the above exercise when needed. Whenever you realize you are gripping too tightly, simply relax your grip. Be patient. It takes time to triumph.

"You can do similar exercises to break the hold of any extreme in handwriting. And that is not surprising, since the same technique is used in other fields, such as athletics." Item 21 in the Bibliography, pages 3-1 to 3-2.

4. GENERAL WRITER'S CRAMP

A. CONCEPT OF THE CONTINUUM.

In the observation of handwriting, many sets of features are taken in turn, each set including related data, such as slant from far rightward to far leftward, or size from near microscopic to very large. These observations form a continuum, a spectrum for one feature of the writing. We mark off specific points on the continuum, such as in size: very small, small, medium, large and very large. While doing so, we recognize that size may be in between any adjacent sizes we have listed and on beyond the two extremes of very small and very large. The specific sizes are marked off only so that we can have benchmarks from which to consider the potentially infinite number of sizes and their variations.

It is in view of this concept of the continuum that I earlier set what I named general writer's cramp as the milder version of clinical writer's cramp. The concept of the continuum helps explain why things may go very bad "all of a sudden, unexpectedly." We are taken by surprise, not because we could not observe what was actually happening, but because the change from bad to worse was so imperceptible along the continuum that we did not advert to the deterioration and the problems it would soon cause us. That is why an outsider or a new member to a group will see problems and potential problems that no one with long experience within the group might see. At times, the outsider or new member, who really only observed what was already occurring, is blamed for the problem: "We never had that bad thing till you came; you must have caused it. Only your talking about it made it happen." In a word, people become so used to things being as they are that the problems inherent in those things and the difficulties arising from the situation are taken as ordinary, even necessary, elements of life as it simply is.

What is the application of this to explaining the cause of writer's cramp to the writer who may not perceive it as a problem? The writer is completely accustomed to the discomfort and even pain of his way of writing. It becomes identified with the very nature of writing itself. Further, experiencing the relaxed and comfortable might be so alien that the writer returns to the familiar, and thus reassuring, routine. I had a case in which that happened. The person learned to produce a flowing, creative cursive form. She put away the fluid ink pen and took up the ballpoint once more, gripping it excessively tightly and producing the chopped up print style which was developed with the first writing lesson 30 some years ago. The fright of feeling out of control and the releasing of long stored tension in the psyche were more threatening than the delight of relaxed and free movement was enticing. Those are situations where we might look to direct the person to a humanistic and dedicated counselor.

One writer was almost at the limit between general and clinical writer's cramp. A gentle and persistent application to writing exercises brought her back along the continuum to mastery. At the beginning she could not write a half hour even without pain creeping up the arm. As she progressed, pain disappeared in the hand, then the lower arm, then the upper. At that point she began to realize the pain of muscular tension in her shoulder and back. The muscular release gradually invaded her entire body, and with it the harboring of emotional tension lessened by degrees. It illustrated that for the most part we do not develop dramatic problems due to instant traumas, nor do we experience instantaneous cures. Ease and disease both grow as all life grows, along a continuum from seed to full flower and fruit.

B. THE "GRAPHIC INDICATOR OF TENSION."

It is a common dictum in graphology that tension in the handwriting is indicative of reaction to stress and strain in the environment. The person internalizes and retains the stress and strain, rather than dealing with it objectively and releasing it. The way I explain that to persons' whose writing I am analyzing is to say that if I were to yell at them now, they would still hear the yelling in their heads day after tomorrow. See Figure 24. Much healthier for them would be to consider the source and shrug it off, yell back right away, or tell me to calm down and speak in a gentlemanly and intelligent fashion if I have a complaint. None of the latter courses of action are available as a practical alternative to the writer with excessive graphic tension. The first sign of success for your client's overcoming of the tyranny of writer's cramp might well be to snap back at you. Immediately jump up on the table and dance a jig in celebration of the joint success the two of you enjoy as an effective team.

5. ANNOTATED BIBLIOGRAPHY

The following citations were selected from a field of journal articles of three times the number included. Papers specifically on dystonia were not included, since the focus is on the physiology of handwriting and on psychological findings directly related to handwriting. Papers were thus left out which were otherwise excellent medical material. Books were included mostly on the basis of reliable information relative to understanding the dynamics of writer's cramp. One book was included only as an example of how terribly bad graphological theory can become when it violates the laws of physiology and lacks an intelligent and rational psychological basis. And, to avoid contemporary controversy, a very old and long since discredited book it is, but one which fortunately has been the subject of an excellent and scholarly assessment by Robert E. Backman who kindly permitted me to quote him. Incidentally, through the generosity of Handwriting Analysis Research Library and of Backman, its curator, the library of American Handwriting Analysis Foundation has both an original copy of the book for reference use only and a photocopy for lending, the latter containing Backman's full notes assessing the work. The medical literature specifically addresses clinical writer's cramp, not what I have defined as general writer's cramp.

JOURNALS

1. Archives of Neurology and Psychiatry. 50:439-49, 1943.

Muscular tension in psychiatric patients: pressure measurements on handwriting as an indicator. By Jurgen Ruesch and Jacob E. Finesinger.

[The summary on page 449 reads: "A method of measuring the grip pressure and the point pressure during the continuous movement of handwriting was used for a series of 40 patients with various psychiatric and neurologic diagnoses and for a series of 12 normal control subjects.

"On writing the same standard sentence the patients showed higher values for grip pressure, a greater number of phases and a longer writing time than did the control subjects. These differences were statistically significant.

"The patients gave a greater number of positive answers to questions concerned with feelings of excitement, nervousness, tiredness, trembling inside, shaking and tension in the arms and fingers.

"A significant correlation was found in the psychoneurotic and the psychotic patients between feelings of neuromuscular tension and high values for point pressure. No correlation was found between feelings of general tension and any of the pressure readings."]

2. British Journal of Psychiatry. 111:841-58, Sept. 1965.

Psychosomatic study of writer's cramp. By A. H. Crisp and H. Moldofsky.

[Starting with the definition and explanation of writer's cramp, the authors survey history of its medical recognition and literature of its diagnosis and treatment. Seven case studies are reported, providing handwriting observations of graphological and forensic value. Stress seemed to play a significant role, though the authors say the evidence is clinical, not the result of formal studies. Particularly anger in reaction to stressful situations seemed to loom large. No handwritings are illustrated.]

3. British Journal of Psychiatry. 142:180-3, Feb. 1983.

The treatment of writer's cramp with multimodal behaviour therapy and biofeedback; a study of fifteen cases. By Jean A. Cottraux et al.

[Beginning on page 182 they discuss the problem of alleviating the condition, saying counseling is needed due to the psychological substrate. On page 183 they conclude: "In our sample, writer's cramp seems to be a response to stress related to working conditions." That is confirming of the graphological dictum that tension in the writing is indicative of reaction to stress and strain in the environment.]

4. Canadian Journal of Psychiatry. 25:44-8, Feb. 1980.

Behavioural and biofeedback treatment of writer's cramp. By F. W. Furlong.

[The paper begins: "Writer's cramp is a syndrome of muscular spasm of the fingers and hand during writing. The pen is held tightly, the writing becomes jerky, and the writing position, distorted; the pen may be forced through the paper, and the sufferer becomes preoccupied with the manner of writing. The pain often spreads up the arm to the neck and even into the other arm. The course is usually chronic and progressive. It is a rare disorder, usually beginning between thirty to forty years of age and is more common in men...." We could say it is a persona writing to a pathological degree. The patient, who had domestic and work troubles, was treated with relaxation exercises and biofeedback.]

5. Current Psychiatric Therapies. 1967:69-72.

Therapy of writer's cramp. By A. H. Creisp et al.

[On page 69 they say: "The present authors studied the disorder in terms of the interference of the delicate writing skill by other overriding concurrent psychobiological postures, such as sustained and often unexpressed and/or denied anger. It was found that the associated personality type showed features of obsessionality and difficulties in dependency relationships within the context of the writing situation. We proposed that the diverse clinical forms of the condition were a consequence of the subjects' repeated attempts to overcome the disability by adopting ever new and increasingly bizarre writing postures which also served to divorce them more ... from the original skill. In spite of the continued ambivalence over writing and their failed endeavors the subjects did not avoid but rather retained the commitment to write and persisted in attempts to do so.

"The therapeutic approach derived from the above views was a combined behavioral and psychotherapeutic one."

Anger figures largely in their discussion of the psychological factors. They conclude: "In the light of this experience the authors recommend a therapeutic approach for writer's cramp which combines a behavioristic re-educational approach to the specific writing problem with psychotherapy aimed at the patient's character structure and current life situation."]

6. Developmental Medicine and Child Neurology. 25:778-82, Dec. 1983.

Qualitative changes in dynamic tripod grip between seven and 14 years of age. By Jenny Ziviani.

[During the Vanguard presentation, I employed a transparency showing pen grips which was taken from this paper.]

7. Journal of Behavior Therapy and Experimental Psychiatry. 13:69-72, March 1982.

An operant approach to the treatment of writer's cramp. By Ezio Sanavio.

[On page 69-70: "The development of writer's cramp may be summarized in the four following phases: (1) temporary disruptions of writing, (2) conditioning of the cramping response, (3) operant behaviors which may maintain the disorder, and (4) cognitive behaviors which may maintain the disorder." Regarding phase one, he says: "Temporary microdisruptions of the fine motor skills are a common phenomenon in subjects under stress or in highly emotional conditions."]

8. Journal of Behavior Therapy and Experimental Psychiatry. 14:233, 1983.

Writer's cramp; a habit for reversal? By David Greenberg.

[Re-education entails four elements: (1) awareness training: identifying situation when it occurs and recognizing the actual occurrence; (2) habit reversal practice: realize onset, stop, extend hand/fingers, then continue; (3) co-therapists: for example, support group at home helps to see that 30-minute daily home work is done; and (4) re-education: using such techniques as large felt-tip pens or blackboard then gradually return to pen and smaller writing. He explains the clinical measurements which were done and that all results were effective.]

9. Journal of Mental Science. 93:68-81, 1947.

The nature and treatment of writer's cramp. By M. Narashimha Pai.

[Excellent samples of writing are given. On page 72 appear samples for one patient before and after hypnosis, four days of bed rest and anaesthesia. The improvement is dramatic. Even so, the second sample shows narrowness, irregular pressure emphasis and displaced pressure. He discusses the general agreement that the origins of writer's cramp is either physiogenic or psychogenic. However, I have seen cases of mild cramp where it was simply a matter of poor training and undeveloped skill. With one child, a fifteen-minute session in how to hold the pen and employ finger flexion solved his problem.]

10. Journal of Neurology, Neurosurgery, and Psychiatry. 48:782-7, August 1985.

Increased co-activation of the upper limb muscles in writer's cramp. By M. Hughes and D. L. McLellan.

[On page 786 they state: "A theoretical explanation for excessive triceps activity in our patients would be that the patients sat in a more hunched position than the controls, pressing their forearms down hard on the table, while they performed their tasks." When drawing a star with straight lines between designated points, there was no cramp, although there was while writing. "This suggests that the tendency for dystonia to develop during writing is associated with certain requirements of the motor performance of writing . . . because of two concurrent requirements. The first is to hold the pen securely in the fingers and to keep it applied evenly to the paper. The second is to permit rapid and very fine modulations of activity in all the co-activating muscles."]

11. Journal of Questioned Document Examination. 2:18-30, March 1993.

The chemistry of handwriting. By Carl E. Anderson.

[The abstract reads: "Skilled motor performance such as handwriting is the result of very complex exchanges of energy produced by chemical reactions in the nervous and neuro-muscular systems. Neurotransmitters produced by nerve cells are the activators and signal carriers in the process. Disease, toxins and drugs interfere with the production and function of neurotransmitters with resultant changes in motor performance.

"Variations in handwriting and signatures are more easily understood when the physiology of the production of writing is appreciated."]

12. LANCET. 8309:1220, Nov. 27, 1982.

Writer's cramp. (Letter) By V. P. Simmons.

["Writer's cramp . . . is . . . very probably due to muscle ischaemia. . . . .

"Strongly contracted muscles will shut down the low-pressure capillary vessels completely, and the resultant ischaemia will cause pain and other well-know symptoms. If this ischaemia recurs, it can be expected, in time, to damage nerves, muscles, tendons, or tendon sheaths. Short of this, a learned behaviour may be acquired wherein the initial spasm quickly spreads to affect other muscle groups and so become disabling." Ischaemia is a mechanical restriction of the normal blood flow.]

13. LANCET. 8314-5:71-2, Jan. 1, 1983.

Hypnotherapy for writer's cramp. (Letter) By John A. O. Berson and Leslie Gresson Walker.

[Samples for before onset, during the symptoms and after treatment indicate both that the hypnotherapy restored the "before" condition and that the "before" and "after" conditions were sadly needful of remedial writing assistance. This supports my layman's view that writer's cramp is a continuum and that the clinical condition is only the aggravation of a persona writing especially marked by excessive grip and pen pressure, the latter unvaryingly heavy in all four stroke directions.]

14. South African Medical Journal. 63:702-3, April 30, 1983.

Treatment of writer's cramp with sodium valproate and bachofen; a case report. By R. Sandyk.

[At page 73: "These two reported cases confirm that cramp is probably a form of focal dystonia in which a deficiency of the central neurotransmitter GABA plays an important role." I like the verb "confirm" and the adverb "probably" being put together; the author is very sure that he is not certain.]

15. Surgical Neurology. 31:133-7, Feb. 1989.

A cause and cure of some cases of writer's cramp. By Francis Murphey.

[The abstract says in part: "An analysis of 100 cases of ruptured C6 disk, proved at operation and taken at random from the files of Semmes-Murphey Clinic, was carried out, and showed that 60 of these had pain in the right arm and 40 had pain in the left arm. Twenty of those with right arm pain had writer's cramp. There was one questionable case of writer's cramp in the left arm. Of the 20 who had writer's cramp, 13 had complete relief of writer's cramp and pain, one had no relief, and there were 6 lost to follow-up. At least one cause of writer's cramp is suggested, but no claim is made that this is the only cause." Pre- and postoperative samples of writing are given. Medical evidence such as this should give us great pause in attributing a personality interpretation to any graphic phenomenon which can be associated with a physiological condition. On the other hand, it may provide a reliable forensic clue to the identify of the writer.]

BOOKS AND MONOGRAPHS

16. Backman, Robert E.

Review: Kintzel-Thumm (Ivanovic), Magdelene, “Psychology and pathology of handwriting.” Privately issued, 10-3-61.

[The review provides historical background which I have seen in no other English language work. This gives the context to understand how and from where Kintzel-Thumm plagiarized some of her material, with, however, managing most often to distort it. The review proceeds with a page-by-page critique. It is rare that one can experience a true scholar showing both scope of conception and detailed precision in assessing a work. You may obtain a copy of this review, post paid, by sending $4.50 to HARL, 91 Washington St., Greenfield, MA 01301. The text was typed by Backman himself, with all the evidence of arthritis and an old-time manual, both of which, I think, add a charming quality.]

17. Frazer, Persifor.

Bibliotics; or the study of documents. With a new preface by Ordway Hilton. Series: Foundations of Criminal Justice. NY, AMS Pr., 1974. Reprint of 3d ed., Philadelphia, Lippincott, 1901.

[During the Vanguard presentation, I employed a transparency of the skeletal arm which was taken from this book.]

18. Hagan, William E.

A treatise on disputed HW.... Albany, NY, Banks & Bros., 1894.

[Chapter 4: "How individual habit becomes manifested in writing," pages 53-78. This chapter provides excellent instruction in the physiology of the production of handwriting.]

19. Ivanovic, Magdelene, nee Kintzel-Thumm.

Psychology and pathology of handwriting; translated from the German by [the author]. New York, Fowler & Wells Co., 1905.

[Ironically, she begins by more than warning the reader not to be so foolish as to rely on any theory she propounds. The Preface reads: "In order to give to my graphological observations a psychological base, I tried in vain to make use of one of the existing psychological systems, and, therefore, had to construct one myself, as shown in the introduction." Anyone can give psychological support to any theory, no matter how hair-brained, if one would only dream up a suitable psychological system out of thin air.

The first part of the introduction, with its peculiar punctuation, which if found in handwriting would be a sign of psychological disturbance, reads:

"All mental and bodily conditions and functions of human beings can be expressed with two words and their negations: consciousness and movement—unconscious, unmoved. Moved consciousness is—to think; conscious movement is—to will; unmoved consciousness is—to feel, in sense of condition, mood; unconscious movement is—to feel, in sense of instinct, impulse. The first two functions: moved consciousness—to think, and conscious movement—to will, have the brain for their central organ. We shall therefore call them brain or cerebral functions. The two remaining functions, though, seem to reach beyond the activity of the brain; we shall call them psychophysical functions.

"Both kinds of functions can be of an objective and subjective nature in dependence of their motive being an external or internal one.

"The main distinctions between the cerebral and the psychophysical functions are these...." Then follows three points of equal mishmash, which in turn are followed by this: "The realm of the psychophysical functions being far more extensive than that of the brain functions, we shall consider it ahead of the latter." The next fifteen pages of psychological nonsense are excellent preparation for her off-the-wall interpretations. If you look askance at any empirical foundations for graphological theory, this is your ideal theory. The title seems well chosen, as its psychology of handwriting is a pathology. No graphologist who earned any reputation of note regarded her theories seriously. Indeed, at the First International Congress of Graphology in Paris, in 1928, Robert Saudek remarked to Jules Crepieux-Jamin that Kintzel-Thumm's book was dangerous. The only famous graphologist who used her ideas, but without credit as was his wont, was Bunker.

Backman told me the book was claptrap but that the lady did make one positive contribution: Her penchant for observing isolated details brought awareness of some detailed observations to serious and intelligent investigators. However, Backman says in his notes: "This book should be used with extreme caution because it is full of serious errors."

I make these extended remarks only to illustrate how terribly wrong we can go if we fail to base our theories, and thus our interpretations, only on proper, thorough and rigid scientific observations of the physiological characteristics of handwriting.]

20. Kapit, Wynn and Lawrence M. Elson.
The anatomy coloring book. New York, Harper & Row, 1977.
[During the Vanguard presentation, I employed a transparency showing muscles and tendons of the hand and fingers which was taken from this book.]

21. Matley, Marcel B.
Better penmanship. A copyrighted, unpublished ms. 1988.

22. Nevo, Baruch, ed.
Scientific aspects of graphology; a handbook. Springfield, IL, Charles C. Thomas, 1986.
[The book has excellent discussions of stress and tension in handwriting. Look up both terms in the subject index. A handwritten inscription in the copy at the University of Nevada at Reno Library reads: "This book is all wrong. I am not crazy. I am all normal Why would they say I am insane? They all want to hurt me." Which I consider an eloquent validation of graphology. See Figure 25.]

23. Quirke, Arthur J.
Forged, anonymous and suspect documents. London, George Routledge & Sons, 1930.
[Chapter 3: "The physiological analysis of handwriting," pages 19-63, is excellent for how particular movements of fingers, hand and arm affect the handwriting. However, I have not seen a book or article specifically in questioned documents which addresses the topic of tension and release in handwriting, yet the habit of it is certainly a part of the complex which makes a writing uniquely individual and thus identifiable. In general, pressure in handwriting seems to be something of which handwriting experts are largely unappreciative, if not simply ignorant. Most often considerations of pressure are part of the catch-all phrase "line quality," a term I have told cross-examining attorneys was the cover for everything the expert does not know about handwriting or cannot explain intelligently.]

24. Roman, Klara.
Handwriting; a key to personality. New York, Pantheon Books, 1952.
[Even a brilliant author and researcher like Roman thought that release was in up strokes and tension in down strokes. At page 284 she says: "As a rule movements tending downward, or downward and leftward, or simply leftward, symbolize retention, the attitude of taking and holding on; the concomitant muscular state is that of contraction

without adequate release, i.e., tension. Movements tending upward, or upward and rightward, or simply rightward, symbolize an attitude of openness to the give and take of life, a free approach to persons and situations. The concomitant muscular state is that of release following on an interim of tension."

In reality, both release and tension ought to be found in both up and down strokes, as well as lateral strokes to both right and left. Additionally, the muscular tonus needed to hold the pen (as well as other aspects of writing posture) exhibits both tension and release according as it is sufficient on the one hand as versus too much or too little on the other.

Even psychologically, symbolically, down and/or left and up and/or right strokes have no necessary relation to the "retention" and "openness" alleged, because the expressive gestures themselves may be either retention or openness or neither. To illustrate with two graphic symbolisms. Rightward, straight connectives indicates keeping at a social arm's distance from others, figuratively shoving them away. Pressured up strokes are the prime indicator of anger, hardly an openness or release. To illustrate with an example from ordinary physical gestures. You can only hug a loved one with flexor gestures, equivalent to down/left graphic gestures. Psychologically and socially, hugs have released more interpersonal tension and lack of openness to others than almost any other technique. Do not take my word for it. Test it out for yourself! Now what muscular equivalent to a hug can we find in handwriting? A flexor/adductive gesture, that is a stroke downward to the left, right into the bosom of the writer.]

25. Saudek, Robert.

Experiments with HW. London, George Allen & Unwin, 1929. Reprint: Sacramento, CA, Books for Professionals, 1978.

[Suffice it to say that if one does not know Saudek, one does not know handwriting. If one knows Saudek, *and properly understands,* one begins to know handwriting in a scientific way. Unfortunately, some authors cite and even quote him, but then they assert some (to be charitable) questionable theories. No contemporary experimental research in handwriting, the report of which I have seen, is the equal of Saudek's experimental methods. Most are not even in the same league.]

6. AN ESSAY IN THE PSYCHOLOGY OF FREE CHOICE

1. To be free in choice is to be indetermined when faced with multiple possibilities and to have the ability to be self-determined as to which of those possibilities to pursue. It is not an absolute indetermination, but a certain kind of thing we are indetermined towards and a certain kind of way of being indetermined. The kind of good thing we value as worth going for determines the possibilities we consider when determining whether to obtain it or not. No matter how really bad the thing is which we think is good enough to go for, we can only choose it because we think it is good in some way. The very heart of free choice is that, once we have a yen to go for what we think is good enough to go for, we choose to go for it in one way or another way, in this way or no way at all (as when we end up deciding not to bother with it for some reason). But the various ways, in which we can go for the good we value as worth going for, are the possibilities to which we start off being indetermined, towards which we have our operational free choice.

To put it another way, our set of values as to what is good or bad, our estimate as to what is worthwhile or not and our belief as to what is or is not our obligation, all these combine as the attitude which guides us when we have to choose. Choice has to do with the actions we take, the things we decide to do or not do, to say or not say, in order to have what we think is good, avoid what we think is bad, try to do what we think is worthwhile, endeavor not to have to do what we think is not worthwhile, either fulfill what we see as our obligation or escape from it. This essay will only consider practical free choice, not that very important attitude which guides free choice more than any other factor. More precisely, it will focus on ways to eliminate the things which diminish or take away free choice and how those ways can go wrong.

2. Each possibility which free choice can consider holds promise of multiple potentials. Suppose someone decides that a pig in a poke is well worth going for. (A poke is an old expression for a sack or similar container; thus to buy a pig in a poke is to buy a pig which you cannot inspect before hand, making it more of a risky proposition than it would normally be.) Operational free choice in obtaining the pig comes in choosing what the person sees as the available, practical courses of action. These possibilities are not necessarily the actually existent ones, but those which the person perceives as reasonably successful possibilities in the circumstances. In the case of the pig they might be to steal it, buy it, or offer something in trade. Each possibility holds its own potentials, which the person may or may not perceive, but those that are perceived go into the mix of choosing a particular course of action to embark on, or maybe just backing off and choosing no course of action. So, for example, stealing might hold the perceivable potentials of being shot by the owner, being prosecuted for theft, obtaining a pig and retaining all one's

money at the same time, having an exciting adventure, and developing a new profession if one proves good at it. Each of those potentials entails new possibilities with further potentials. It is obvious that every choice we make can have ramifications which we might never attend to or even be able to foresee. However, whether one foresees the ramifications or not, one implicitly chooses them by choosing that particular possibility. Reducing the occurrence of choosing ramifications blindly belongs to the development of greater prudence.

3. To choose is to give up all possibilities but one. To be good at choosing anything, one has to be good at letting go of a lot of other things. Regret is born when we waste time looking back at the past moment of choice and fantasizing about how nicer alternative choices might have been. But that is a topic for another essay. Together we will choose to pursue the line of inquiry already begun.

4. Commitment means no holding back in the choice. Children, and immature adults, may think that giving a promise to do something is not a binding promise if one keeps one's fingers crossed, literally or figuratively, while giving the promise. That is holding back on a choice. The holding back may be at the time of choice or later on when one's fantasy wanders, as a husband who starts girl-gazing rather than maintaining proper attention and devotion to his wife. Committed individuals will not tolerate such holding back, because their honor underlies their commitment. Without commitment, there will be no perseverance in the choice as to one's course of action and thus no success, no accomplishment. The nature of commitment and of perseverance and how they differ from tenacity, persistence and compulsion could be the subject of extended discussion.

5. The pay-off is that choosing, the giving up of all but one possibility in a given situation, is that it is the only way to fulfill any given potential. Some people, the ones who never quite give up other possibilities and never quite commit themselves to the one they chose, are known as wishy-washy. Just as lack of commitment shows lack of honor, so being wishy-washy shows lack of reliability. But the major thing is that a personal potential can only be fulfilled by effective choice of an intelligent course of action. Complete fulfillment of one's personal potential is called excellence.

6. Therefore, free choice is a spiritual coinage we spend for some anticipated return; wisely so, if the return was well worth the cost; or foolishly, if the return was not worth the cost.

7. An impairment is anything which diminishes the otherwise full range of choices available, resulting in some lack of choice before choice is made. In this context "impairment" should be taken in a very broad meaning. Thus lack of proper tools or materials to effectuate some course of action would be an impairment, as would not having enough information to make an intelligent choice. Every impairment makes for a problem in carrying out one's decision on a particular course of action. Problems have to be taken care of if one wants to obtain the good thing one is going for, because the problem makes it harder or longer or impossible to obtain it. If it did not make any difference in going after the choice, it would not be a problem at all.

8. An impairment to choice may be within the individual or outside of the individual. An example of impairment outside the individual which prevents a person from choosing is the incarceration of someone who wants to go to the opera that night. An example of impairment outside the individual which makes it harder to choose to go to the opera would be shortage of cash and a full debt on all credit cards. It is still possible to scrape the ticket price together, but it takes more effort; or one might volunteer to work at the opera house as usher or supernumerary, but that means more time and effort than just sitting in a seat. If one's goal is to socialize in that circle, then the volunteer position becomes an easier way to gain what one wants. A lot depends on one's attitude, that first view of what one considers as good enough to go for.

9. Impairments within the individual may be primarily physical or psychological. The word "primarily" is used, since psychological impairments may cause physical impairments and vice versa. In this day of holistic health consciousness, examples of this are hardly necessary.

10. A physical impairment is a problem with the body's machinery. For example, every person by nature is designed to be able to see and thus be able to choose to see this thing or that one, to see a given thing or not see at all. Blindness takes away ability to see and thus takes away the choice to see this or that thing, to see any given thing or not see at all. By blindness the person is predetermined to the position of not seeing at all, and so is precluded from being self-determined as to whether one will see or not and as to what one will prefer to see.

11. A psychological impairment is a problem with the management of the body's machinery. A soldier filled with fear during a battle has his ability to choose whether to follow the order to attack or not reduced or even taken away, so that the soldier might

freeze in place or run away without ever making an actual choice. The fear increases the chances of his choosing one possibility over another or simply takes away all but one possibility, thus destroying free choice in those circumstances. Things have thus been effectively determined for the soldier, who is no longer indetermined to all the real, practical possibilities of the situation.

12. A resolution of the problem of an impairment is needed if one is to restore the possibility which was taken away by it and thus regain the potentials which one wishes to fulfill by choosing that possibility. Thus, if the officer in charge cajoles or threatens the fearful soldier with an intensity greater than his fear, or if his comrades' brave behavior either inspires him or simply carries him along, the immediate problem is resolved until more training or counseling or group pressure or personal shame might bring about a deeper and permanent resolution, which means making the attitude towards duty and group loyalty stronger than any fear could be. Then the soldier regains the potentials of a permanent military career, promotion, winning a decoration for bravery, maintenance of the companionship he has enjoyed, pride and approval of his parents, and so on.

13. A physical impairment may properly be taken care of in five ways: compensate, substitute, correct, adapt or avoid. Please note that I am not using these five words in the technical meaning of modern psychological theory, but in their plain language meanings.

(a) The person may compensate for the impairment, which is to employ some other activity or tool to make up for the lack in order to balance out any shortcoming (for example, wearing eyeglasses to compensate for the impairment of near sightedness);

(b) The person may substitute another person, place, thing or activity for the problematic one (for example, when lost, instead of struggling to read the small-print map, one may set the map aside and look for a stranger who will give directions, thus substituting a person for the map);

(c) The person may correct the impairment such as through restoring health to an ill or injured organ or developing a new skill (for example, having eye surgery to end near sightedness or do exercises to improve the eye's strength and performance);

(d) The person may adapt to the impairment, which is to decide to live with it and struggle on as best one can (for example, squinting to overcome near sightedness, which would be a reasonable solution if one cannot afford glasses or a reliable surgeon); or

(e) The person may practice avoidance of situations where the impairment occurs (for example, resting the eyes when they tire or just not reading small type).

14. Each of these four ways might result in ineffective or even disastrous solutions to the problem. The eyeglasses might be poorly made and cause worse damage. The stranger might give directions which make one more lost than ever. The surgeon's hand might slip. The seeming success of the squinting might lead the person to neglect proper medical care until the damage to the eyes is irreversible or beyond relief. Avoiding the small print might lead the person to sign contracts with provisions left unread or misunderstood. Good judgment in practical matters, which is called prudence, is needed all along the way in making and effectuating choices. That also is a topic for an entire other essay.

15. A person may try to take care of a psychological impairment in the same five ways. Only one will work, but only if employed correctly.

(a) Compensation always masks the real problem and creates new ones (a common instance is when parents compensate for their feeling of inadequacy as parents by showering gifts and money on their children, who might then grow to be selfish and somewhat useless adults).

(b) Substitution is usually a fool's paradise wherein the person feels better immediately but will be worse off later (drinking alcohol to relieve loneliness is a substitution of booze for social adequacy; besides a hang-over, it may well lead to cirrhoses of the liver and the loss of many decent friends).

(c) Correction is the only method which really works, and it will be discussed next.

(d) Adaptation means institutionalizing the underlying problem; it requires misapplication of another function, thus creating a new impairment in another area (for example, one's experience may be that anyone disagreeing with the boss is fired, which touches on one's impairment called lack of self-confidence whereby one believes one can never find another job, so one always says, "Yes, sir," thus institutionalizing the lack of self-confidence and using the gift of language for being obsequious rather than telling the truth).

(e) Avoidance means surrendering a chunk of life to unhappiness, choosing (wittingly or unwittingly, but equally effective in either case) to give up choices in some possibilities and thus to lose any opportunity for fulfillment of the potentials following upon those possibilities (in the above example the employee might disappear into the woodwork to avoid ever encountering the boss, thus never growing in assertiveness while remaining a miserable, moral coward forever).

16. Correction is the only effective way to take care of psychological impairments and the mental, volitional and behavioral patterns involved. To do so, one must do the following:

(a) See the impairment for what it is (correction must be built on truth about oneself, since self-knowledge is the beginning of wisdom, and self-correction is definitely a wise thing to do);

(b) Understand the contrary healthy pattern (to arrive at a goal, it helps to have it clearly in mind);

(c) Develop an awareness of the occurrence when the impairment's pattern occurs (which means the individual may at times be a fully aware witness of one's own foolish or otherwise negative behavior but incapable of doing anything other than persisting in the behavior; in other words, have unimpaired awareness of one's own undesirable behavior but have a very impaired ability to do anything about it on that particular occasion);

(d) Take some corrective action when the impairment occurs (even the least corrective action, such as only being able to admit to oneself, "I am making a fool of myself," contributes ultimately to total victory over the impairment);

(e) Systematically practice the acts belonging to the healthy pattern (an ill-mannered person would thus deliberately perform a courteous act for no other reason but to practice courtesy; patterns of learned behavior are a type of habit, and habits are made of many acts deliberately put together, just as brick houses are made of many bricks deliberately laid together correctly. Habit is another topic deserving its own essay).

Please note that each of these steps occur gradually, and generally in the above order, though not necessarily always in that order. Every success in any one of the five steps makes it easier to have success in the other four. Each little success leads and contributes to total victory.

17. Each of these five steps can be employed incorrectly. As stated above, prudence is needed throughout our exercise of free choice. Here are illustrations of ways in which they can be employed incorrectly.

(a) Since an incorrect solution to a problem most often creates a new problem on top of the old, one may take the results of the incorrect solution as the real problem to be solved. Even if that later one is solved, the original unhappy condition remains, and it may remain unrecognized, working its mischief in the background of the mind.

(b) One may have an incorrect idea of what the contrary happy condition is. For example, I knew of a fellow who went to a special camp to overcome his alcoholism. They drank lots of coffee laced with lots of sugar and smoked lots of cigarettes. After two or three months he felt no craving for alcohol. Once away from "the cure" and the readily available and large quantities of sucrose, caffeine and nicotine, he went back to the bottle as if there had been no intervening "clean" period. The camp's "solution" was a false idea of what sobriety is.

(c) Some cultures require women to be incased in clothing so that men will not be tempted. They have a false awareness of when and how the problem of temptation to sexual sins and crimes occurs. When people require others to suffer indignity or be subjugated as a solution to their own recurring problems, they have a false awareness of when the undesirable pattern arises and thus cannot perceive what they must do in reforming themselves. However, such false perceptions have one thing to be said for them: They provide humans with nifty excuses both for one's inadequacies and for one's penchant to demean and exploit others.

(d) Some men given over to violence do so because they think that is the best corrective action for their perceived problems. The solution is applied immediately, which is what is wanted in corrective action, but it is applied to an innocent other rather than to an inadequate self. Recognizing one's own inadequacy is what is required by the first step in psychological corrective action. Confusing a problem inside oneself with a problem outside oneself is most often the key mistake being made, though it is just as disastrous to confuse what is outside oneself with what is inside, such as happens when people figure it was solely due to their own mistake when someone else victimizes them.

(e) Practicing the wrong habit in order to solve a problem is very much evident in organizations which set up private paramilitary camps and teach followers how to take the law into their own hands. Modern private-party terrorism results from the careful cultivation of a new habit far worse than the originally perceived ill.

18. AN EPILOGUE. This essay was begun while researching papers on writer's cramp. To correct writer's cramp one needs to make new choices. In order to make those new choices, one has to recognize the pattern of writing behavior which is contrary to the design of the healthy graphic motor sequence. Practice of specific writing acts, which go to build a new, healthy manner of writing, is required. Drugs or prostheses may provide immediate relief, but they do not provide a cure. Only development of correct writing habits will ultimately relieve writer's cramp.

Further, absent an underlying organic problem, simple writer's cramp probably arose, at least in part, out of improper handling of inward tension arising from stress (dystonic writer's cramp has an organic source and so requires medical care). Ultimately the person will have to face and resolve the attitude towards, and reaction to, situations in which the stress arises. The attitude may be one of helplessness: What can I possibly do about this situation? The reaction is always internalized and retained tension. The person offering handwriting remedial assistance ought to be prepared to assist in a proper way if the psychological difficulties associated with the writer's cramp become an issue during remedial penmanship. It would be irresponsible to embark on a course of action with another person and jump ship, as it were, if the vessel happens onto dangerous shoals. At the very least, one must know where to refer the individual for adequate counseling. It is unethical to inaugurate services to others and not be competent and willing to follow through when difficulties arise, or even to fail to give reasonable consideration to what difficulties might arise.

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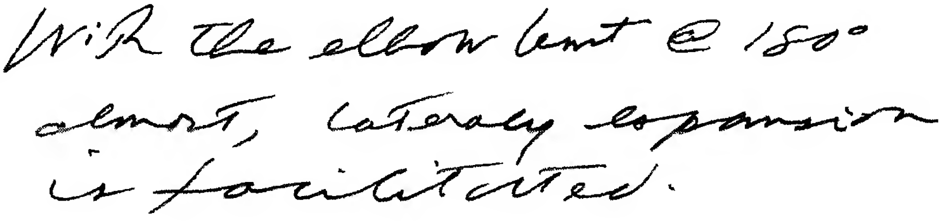
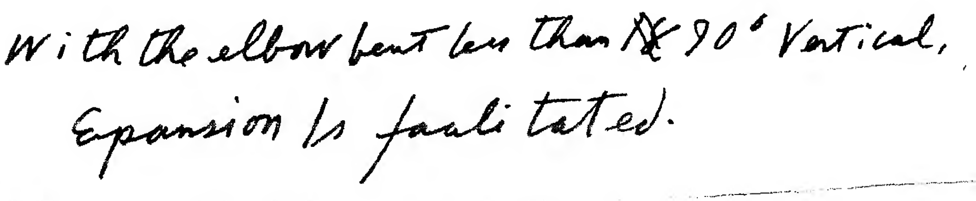
"On free choice," pages 117-155.

ILLUSTRATIONS

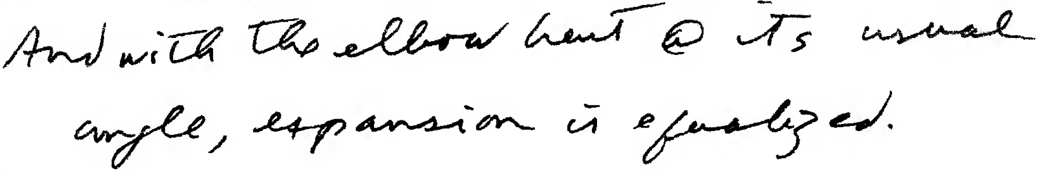
The following three sentences are Figures 1-3. Figure 1 reads: "With the elbow bent at 180° almost, lateral expansion is facilitated." Figure 2 reads: "With the elbow less than 90°, vertical expansion is facilitated." Figure 3 reads: "And with the elbow bent at its usual angle, expansion is equalized."



With the elbow bent @ 180°
almost, lateraly expansion
is facilitated.

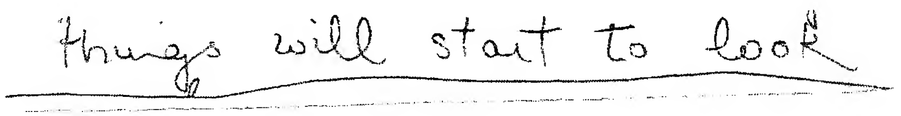


With the elbow bent less than 90° Vertical,
Expansion Is facilitated.



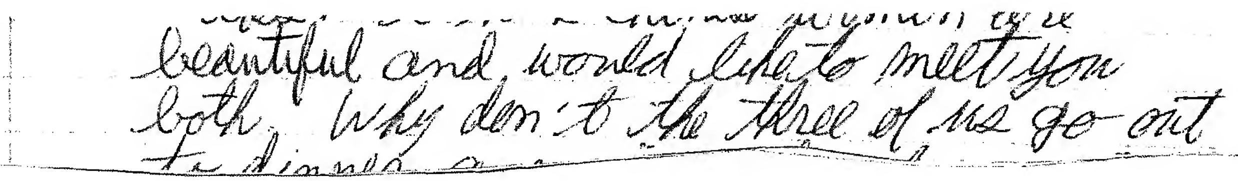
And with the elbow bent @ its usual
angle, expansion is equalized.

Figure 4. Misalignment at base line. The hand slides up after "g" and back down after the first "l," is repositioned for "st" and slides down at end of "r" and is repositioned for "to" and "look."



things will start to look

Figure 5. Misalignment through slant. The elbow is kept fairly near the side and the forearm extended outward as the writing progresses across the page, with downstrokes made on about the axis of the forearm.



beautiful and would like to meet you
both. Why don't the three of us go out

Figure 6. Different zones of same letter offset. If you drew a line to mark the slant of the axes of the mid and lower zones of these letters, the two slant lines would be offset. This indicates that the hand moves to the right before forming the lower zone portion.

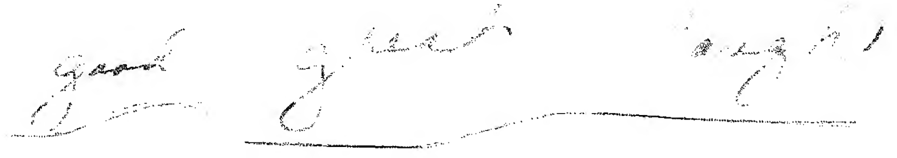
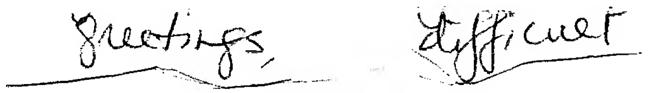
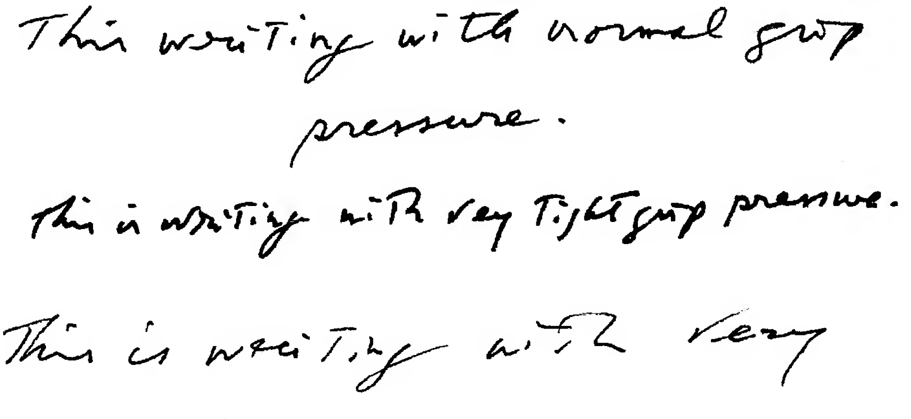


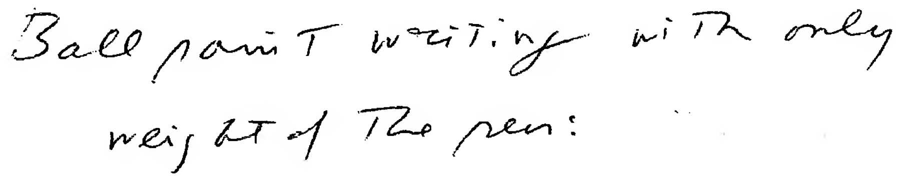
Figure 7. Different zones of same letter with different slants. If you drew a line to mark the slant of the axes of the above and below base line portions of some letters, the slants would be divergent, rightward above the base line and vertical below. The wrist is pronated for a dominant abductive movement above the line but flexed vertically for a dominant flexor movement below the line.



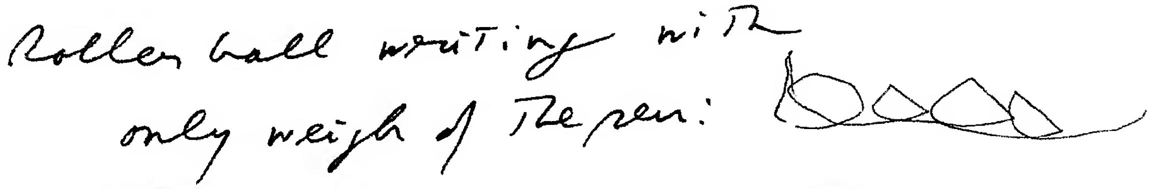
Figures 8-10. Figure 8 reads: "This writing is with normal grip pressure." Figure 9 reads: "This is writing with very tight grip pressure." Figure 10 reads: "This is writing with very loose grip."


This writing with normal grip
pressure.
this is writing with very tight grip pressure.
This is writing with very
loose grip.

Figures 11 and 12. Figure 11 reads: "Ball point writing with only weight of the pen:" Then follows a ductus which is barely visible in part on the original. Figure 12 reads: "Roller ball writing with only weight of the pen:" As you can see, the ductus is easily visible even in the reproduction.

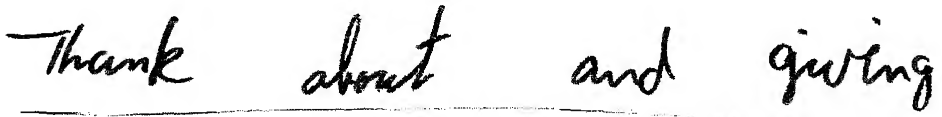


Ball point writing with only
weight of The pen:



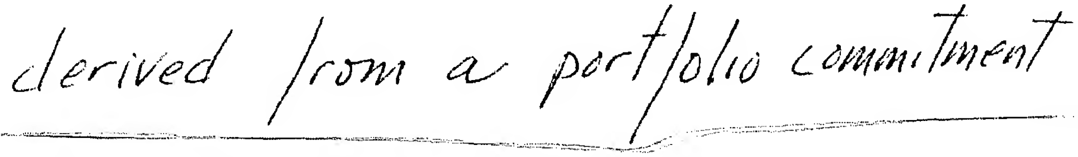
Roller ball writing with
only weigh of The pen:

Figure 13. Tight, angular turns in connectives. Actually, the angle occurs because there is no connective, rather the next letter is started immediately.



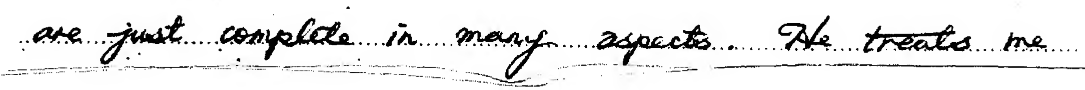
Thank about and giving

Figure 14. Narrow, angular letters. They are narrow, not because of actual width, but width relative to the height of the mid zone down strokes. In this case, mid zone letters are about half of the proportionate width.



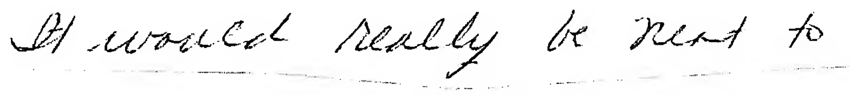
derived from a portfolio commitment

Figure 15. Retracing. As Saudek observed, in retracing width is reduced to zero. The rightward lateral expansion is carried almost solely by abductive muscles, rather than the coordinated effort of flexor/abductive or extensor/abductive. Greater effort is required for successive independent movements of sets of muscles, but more skill otherwise. In handwriting, as in other activities, skill is much harder to obtain but much easier to live and work with.



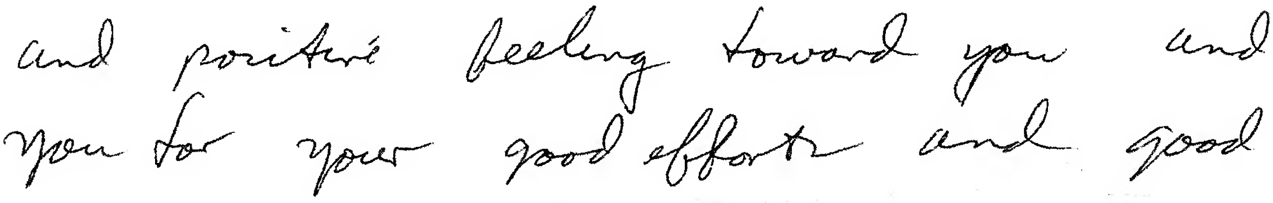
are just complete in many aspects. He treats me

Figure 16. Shortened upper and lower zones. Below, the shortened upper zone happens, I believe, because the fingers are set at their maximum upward flexion to start with. See Figure 17 for shortened lower zone, where, I believe, the pen begins tucked toward the palm of the hand, thus it has maximum room to flex upward but limited room to flex downward, unless a special, situational adjustment is made of the writing hand.



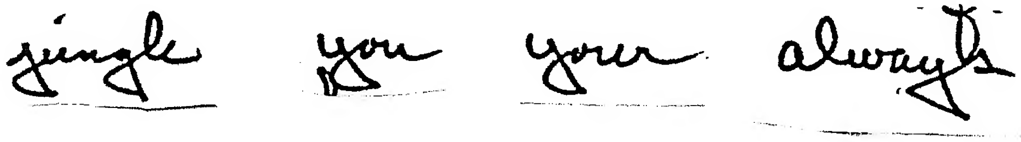
It would really be nice to

Figure 17. Base line dropping after lower zone formation. This occurs because the person has impaired finger flexion downward. The hand must drop to make a lower zone form but is not repositioned all the way back up. Note in "feeling" and "for" there is virtually no lower zone extension and thus no alteration in base line.



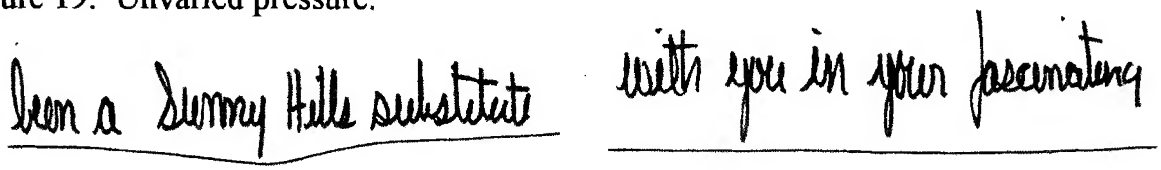
and positive feeling toward you and
you for your good efforts and good

Figure 18. Change of angle due to elbow swinging in and out. The elbow swings out for the lower zone down stroke and comes back in on the connective to the next letter.



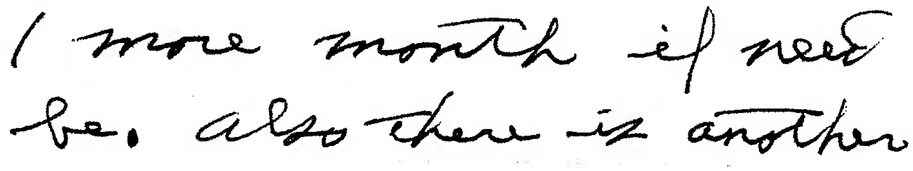
jingle you your always

Figure 19. Unvaried pressure.



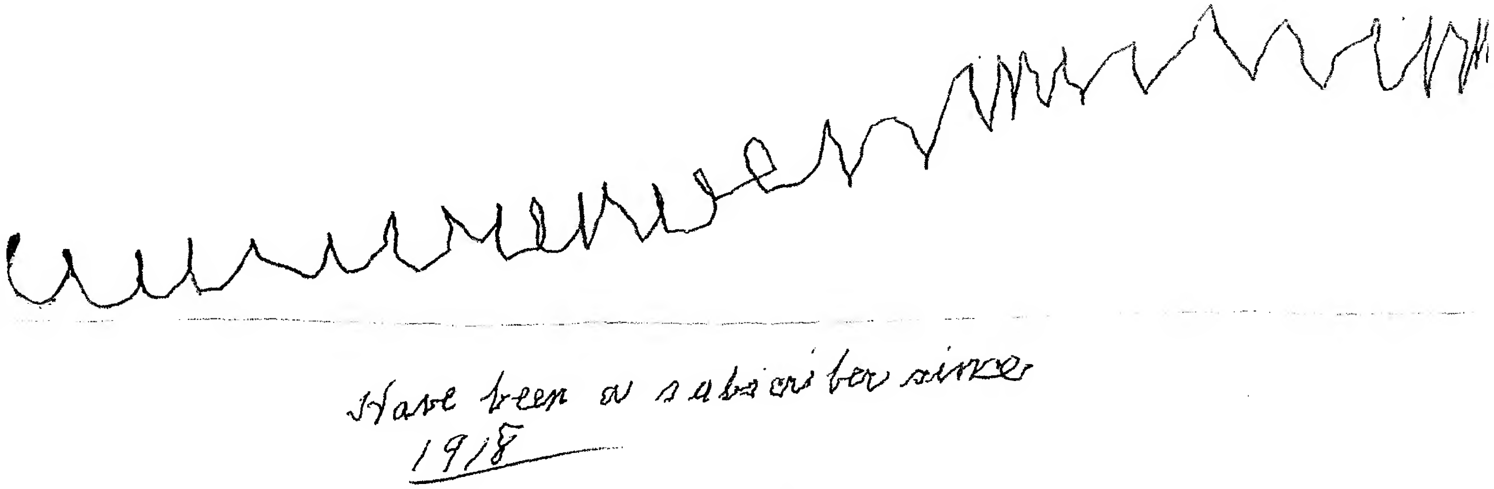
been a Sunny Hills substitute with you in your fascinating

Figure 20. Displaced pressure. Here it is caused by the same mechanics as the long, straight rightward strokes: lateral push by the thumb on the left side of the pen. The irregularity is mostly due to constant adjustment into and out of that lateral grip.



1 more month if need
be. also there is another

Figure 21. Tremor. The first sample is of a kindergarten boy who was even afraid to visit us, his neighbors, because he would be scolded for "bothering" us, though we would gladly have had him for our own. In writing, the child's anxiety about "doing it wrong" prevents him for doing it well. The second sample is neurological. The first is called "muscle tremor" or "gross tremor" and is from tension in the voluntary muscles. The second is called "true tremor" or "fine tremor" and is from a neural pathology.



Have been a subscriber since
1918

Figure 22. Awkward ovals and curves made in rectangular form. In this case, the gentleman had severe arthritis which prevented finger flexion, thus only the gross muscles of the hand and arm were available to make curves, not the fine, delicate finger flexions which permit us to make small, precise and fluent turns.

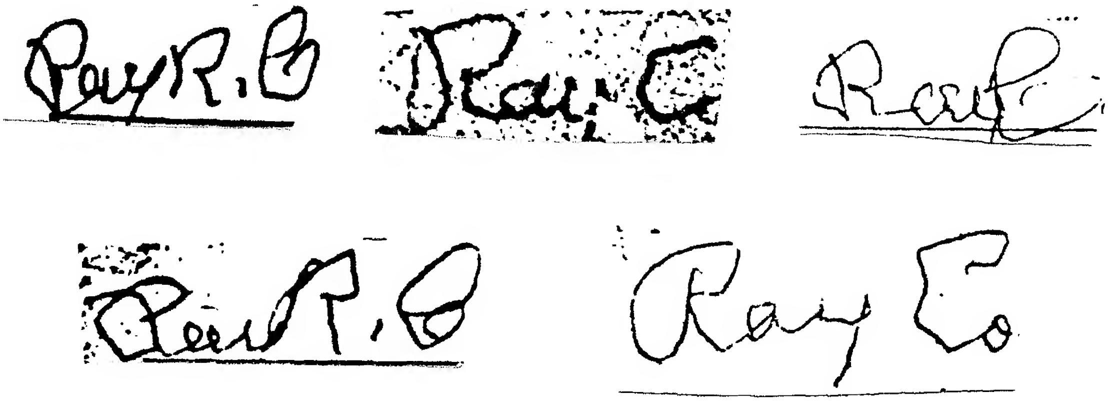
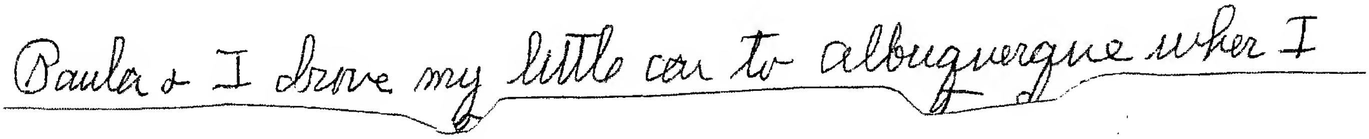
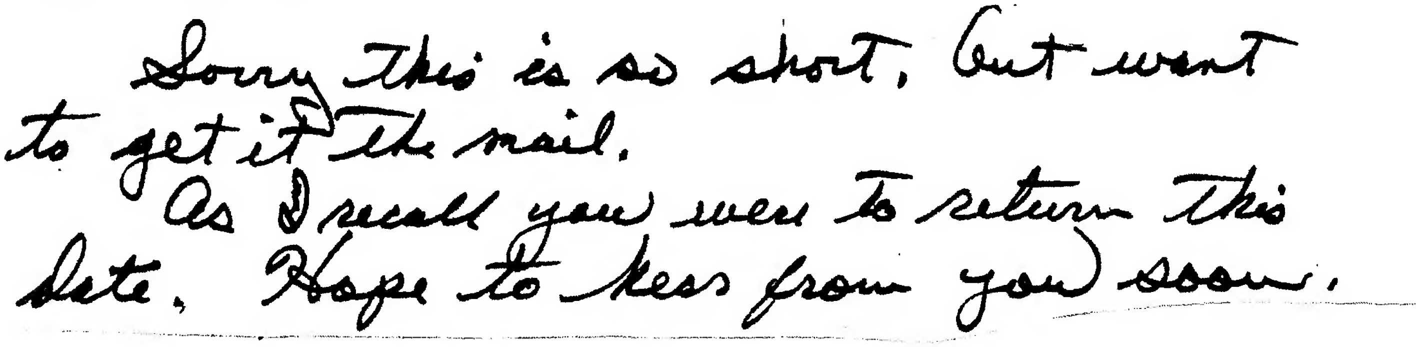


Figure 23. Awkward ovals and curves made in triangular form. Ovals generally lack a clear, abductive movement.



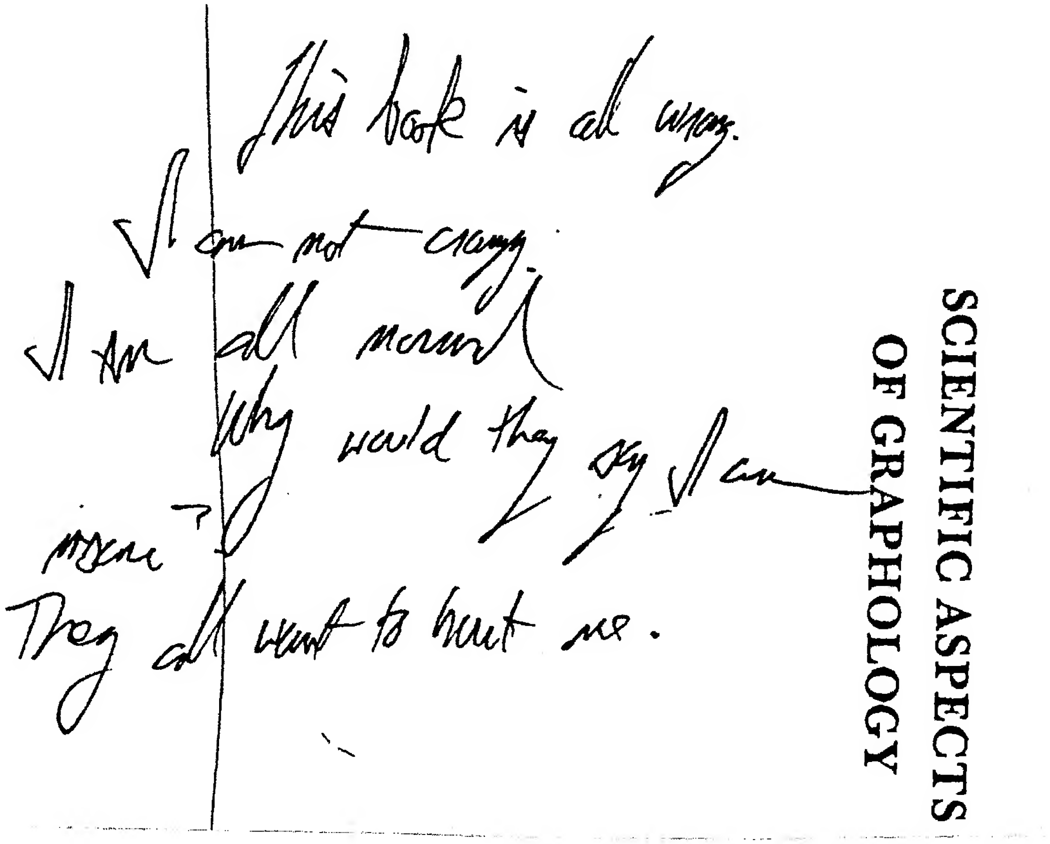
Paula & I drove my little car to albuquerque when I

Figure 24. One who "hears" a shouted reproof days later. An imprisoned man writes with great tension; even stomach tension shows in the sharply left-tending angles of most "r's" and "h's."



Sorry this is so short, but want to get it the mail.
As I recall you were to return this date. Hope to hear from you soon.

Figure 25. A bonus sample, which was referred to in the annotated bibliography for Nevo's book.



This book is all wrong.
I am not crazy.
I am all normal
Why would they say I am insane?
They all want to hurt me.

SCIENTIFIC ASPECTS OF GRAPHOLOGY